CASE REPORT

Management of Relapsed Skeletal Class III Malocclusion with Late Mandibular Growth by Bimaxillary Orthognathic Surgery

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ABSTRACT

Skeletal Class III malocclusion usually presents with deficient maxilla, mandibular prognathism or both compromising function and facial esthetics. It is generally corrected in conjunction with orthodontic treatment and orthognathic surgical procedure to harmonize facial profile and to improve the facial esthetics. Development of a surgical visual treatment objective (VTO) and a detailed analysis of pre- treatment investigation are necessary to plan the type of surgical technique required. A 19-year-old male patient with relapse, moderate skeletal Class III malocclusion and concave profile was referred to our department. Skeletally, he presented with mandibular excess and posteriorly placed maxilla along with a hypodivergent growth pattern. Dentally, Class III molar and canine relationship, reverse overjet and anterior crossbite with proclined upper (U1-SN: 122^0) and lower incisors (L1-MP: 97^0). Maxillary advancement was planned in order to correct the mid-face deficiency, and mandibular setback to improve the concave profile and correct the mandibular excess. The decompensation phase involved closure of all the anterior spaces and retraction of the upper teeth. Lower spaces were closed and the incisors were proclined. Negative overjet was created (- 6mm). Bi-jaw surgery which included a Le-fort I osteotomy for maxillary advancement (3mm), bilateral sagittal split osteotomy (BSSO) for mandibular setback (5mm) was done to correct the dental and skeletal Class III This case report describes a multidisciplinary approach in the successful management of a relapsed case with posteriorly positioned maxilla and mandibular skeletal excess to achieve superior function, stability, facial esthetics and an ideal occlusion.

Keywords: Orthognathic surgery, skeletal Class III, Le-Fort I, BSSO, late mandibular growth.

INTRODUCTION

Class III malocclusions have multifactorial etiological reasons which includes genetic[1,2]and environmental factors. On the basis of difficulty, Class III malocclusions are considered to be one of the most difficult problems to treat orthodontically.[3] Class III malocclusions are generally classified into two categories: skeletal and dental. Features of skeletal Class III malocclusion include either retrognathic maxilla or prognathic mandible or combination of both which may be aggravated with vertical and transverse discrepancies apart from sagittal malrelationship. The features of dental Class III include canines and molars in Class III relation, anterior edge to edge bite/crossbites, and reverse overjet. The right diagnosis plays an important role due to the different treatment approaches.[4,5,6] Generally, a dental Class III can be treated with orthodontics alone whereas a true skeletal Class III presenting with compromised facial esthetics, impaired function and varying dentofacial deformity requires an interdisciplinary approach combining orthodontics and orthognathic surgery.[7,8] The involvement of each jaw base to the malocclusion, in all the three-dimensions along with varying degree of dentoalveolar and

soft tissue compensations should be thoroughly evaluated.[9]The treatment plan is established based on the efficacy and thoughtful application by the clinician as well as considering the acceptance by the patient.

One of the most challenging problems confronting the practicing orthodontists is a developing skeletal Class III malocclusion and their results are controversial. For a patient exhibiting psuedo Class III malocclusion, early orthopedic treatment tends to correct the existing or developing skeletal, dentoalveolar, and muscular imbalances and improves the oral environment and facial esthetics. Whereas subjects with true Class III malocclusion, early orthopedic correction is bound to relapse. Hence in such cases, the orthosurgical approach has to be employed, once the mandibular growth is complete. The mandibular growth continues even after pubertal spurt. Hence, surgery should be deferred to after that phase.[9]

This case report describes:

A multidisciplinary approach in the successful management of a relapsed case with posteriorly positioned maxillary and mandibular skeletal excess as per the need of the patient's functional and an esthetic prerequisite.

DIAGNOSIS AND ETIOLOGY

A 19-year-old adult, male presented himself at the Department of Orthodontics, with a chief complaint of spacing between the teeth and forwardly placed lower jaw.

General examination revealed (Figure 1), Ectomorphic body type, mesocephalic head pattern, and hyperleptoprosopic facial pattern associated with a concave profile. Clinical FMPA suggests he was a vertical grower with hyperdivergent growth pattern and anterior divergent jaw bases. Lips were potentially incompetent with a low resting lip line, the lower lip is protruded and everted with a positive lip step.Nasiolabial sulcus is acute, shallow mentolabial sulcus with a prominent chin.

Figure 1: Pre-treatment extra-oral photographs

Intraoral examination (Figure 2) revealedan Angle's Class III molar relationship in reference to the molarson right and left side respectively. Whereas, the canine relationship reflected a Class III relationship bilaterally.Furthermore,proclined maxillary incisors, with spacing in both upper and lower anterior teeth and mesiolingual rotation of 36,45, 46. The lower dental midline was shifted to right in relation to upper. The overjet and overbite were -1 mm and 0 mm, respectively.

Figure 2: Pre-treatment intraoral and occlusal photographs

The cephalometric analysis highlighted a moderate Class III skeletal base with prognathic mandible / skeletal mandibular excess (SNA:79^{o}, SNB:83^{o}, ANB:-4^{o}) and compensating soft tissues. The fault lies in the mandible mainly within increase in size by 7.5mm and dorsal placement by 6mm, and maxilla has inccreased size by 2mm and is dorsally placed by 3mm. Sagittal relation is worsened by hypodivergent growth pattern. The maxillary incisors were severely proclined (U1 to NA: 42^{o}, 11 mm, U1 to SN: 122^{o}) and mandibular incisors were proclined (L1 to NB: 30^{o}, 8mm, IMPA: 97^{o}). The panoramic radiographs showed missing 14,24,35,45 due to previous history of orthodontic treatment 7 years back. Another finding was the root resorption in relation to 36 as a result of the previous orthodontic treatment. No signs and symptoms of temporomandibular joint disorder were elicited through the questionnaire or clinical examination. (Table 1)

Based on these findings, the diagnosis was dentoalveolar Angle's Class III molar relationshipon a Class III skeletal base owing to a prognathic mandible.

The objectives of treatment involved were as follows:

- To correct the Skeletal Class III pattern with hypodivergence.
- To correct the proclination and spacing with respect to upper and lower anteriors.
- To correct the rotation with respect to 23,34,35,38.
- To correct crossbite and negative overjet.
- To achieve stable soft tissue profile with soft tissue harmony and functional occlusion with a normal overbite and overjet.

TREATMENT PLAN AND ALTERNATIVES

The following treatment plan was discussed with the patient considering the treatment objectives and correlating with the patient's requirements.The patient had a concave profile, anterior

cross bite and reverse overjet due to mandibular skeletal excess and a posteriorly placed maxilla.

The initial treatment plan for the patient fulfilling the treatment objectives was an orthodontic-surgical combined approach. Extraction of 36 was planned due to poor prognosis which resulted due to root resorption from the previous orthodontic treatment. Initially, the orthodontic treatment plan that was intended involved the leveling and aligning of the upper and lower arches.

Decompensation was done pre-surgically (increased negative overjet of -6mm) followed by closing of all the spaces by retraction and proclination of lower anteriors using open coil spring, after which the surgery was carried out. The decompensation was followed by bi-jaw surgery.

Orthognathic surgical line of treatment was opted for (maxillary advancement and mandibular set back). Maxillary advancement was planned in order to correct the midface deficiency and mandibular setback was planned to improve the concave profile and also correct the mandibular excess. The bi-jaw surgery planned included Lefort I osteotomy for maxillary advancement (3mm) and BSSO for mandibular setback (5mm).Elastics (Class III) were used to hold the corrections.The patient chose the ideal treatment option and accepted to go ahead with the decided treatment plan.

Stepwise Treatment progress:

Treatment was carried out in three phases:

- Presurgical phase - Alignment/Uprighting and Decompensation
- Surgical phase
- Postsurgical phase – Finishing and settling.

Presurgical phase (10months)

This phase involved 2 stages: Alignment/Uprighting and Decompensation. In Stage 1 Alignment/Uprighting stage, the orthodontic treatment was initiated with extraction of 36 followed by levelling and aligning. The fixed appliance treatment was commenced using0.022 × 0.028 MBT prescription. Initial aligning and levelling involved the 0.016”, 0.018”, 0.017” x 0.025” NiTi, 0.018”, 0.019” x 0.025” SS in both upper and lower arch.The duration taken for this stage was approximately 5 months.

Stage 2 Decompensation, involved closure of all the anterior spaces and retraction of the upper. This stage involved placement of 0.019 × 0.025 SS in both upper and lower arch with Class II elastics and open coil spring to procline the lower anteriors, creating a negative overjet of -6mm. The duration taken for this stage was approximately 5 months. (Figure 3 and 4)

Table 1: Comparison of cephalometric values

Parameters	Pre-treatment	Presurgical	Postsurgical
SNA (°)	79	77	81
SNB (°)	83	83	79
ANB (°)	-4	-6	2
Y-Axis (°)	67	67	68
Witts' appraisal (mm)	-4	-11	1
GoGn-SN (°)	29	30	29
GoMe-FH (°)	59	24	23
Posterior Cranial Base(mm)	41	37	40
Go-Pog (mm)	81	81	79
U1-NA (°)	42	37	35
L1-NB (°)	30	28	27
Interincisal angle (°)	110	116	119
Nasolabial angle (°)	83	84	83
Lower Lip to Eplane (mm)	2	6	3
Basal Plane Angle (°)	23	22	22
UI – SN (°)	122	110	111
LI – MP (°)	97	95	95
NA-Pog(°)	-10	-18	-2

Figure 3: Pre-surgical extaoral photographs

Figure 4: Pre-surgical intraoral and occlusal photographs

SURGICAL PHASE

The intermediate and final splints were fabricated using the simulated mock surgery protocol. The bi-jaw surgery involving Le-Fort I osteotomy (maxillary advancement) of 3 mm and bilateral sagittal split osteotomy (BSSO) for the mandibular setback of 5 mm was carried out which was plated using the final splints. Following removal of the stabilizing splint, the acquired occlusion was checked with the predetermined occlusion. Later Class III elastics were placed to hold the corrections in place. The duration taken for this phase was approximately 1 month.

POSTSURGICAL PHASE

Postsurgical orthodontics was continued after surgery to close minor spaces distal to canines in both upper and lower arches. The main objective of this phase involved the finishing and settling stage, where 0.016" SS wire was placed in both upper and lower arch with bracket repositioning and settling elastics. The goals of this phase involved the rehabilitation and restoration of the neuromuscular function and to achieve superior function, stability, facial esthetics, and an ideal occlusion. Occlusal function and settling were significantly improved through the use of intermaxillary or settling elastics. The post surgical phase lasted for 2 months. Post orthodontic treatment, the patient was then referred for prosthetic rehabilitation of the missing teeth. (Figure 5 and 6).

Figure 5: Post-surgical extra oral photographs

Figure 6: Post-surgical intraoral and occlusal photographs

RETENTION PLAN

It involved the delivery of upper and lower fixed lingual retainer and Beggs' wrap-around retainer.

RESULTS

The appraisal of the treatment outcome showed a well-aligned dentition where, extraorally he demonstrated a pleasant smile with a well-balanced facial profile and competent lips. Cephalometric evaluation and superimposition confirmed an exemplary change in the profile and the case was finished in the Class I skeletal base(SNA:81^0, SNB:79^0, and ANB:2^0). Fixed prosthesis were given from 33-35,36-37 and 43-45.

The intraoral photographs and study model revealed a well-settled occlusion with Class II molar and Class I canine relationship on both the sides. Ideal and appropriate overjet and the overbite was achieved post treatment. (Figure 7 and 8) Post-debonding, the retention procedure comprised of upper and lower fixed lingual retainers and Begg's removable wrap around retainers in both the upper and lower arch. The overall treatment duration lasted for 13 months, following which the patient was satisfied with the treatment results and improved facial esthetics, profile, and appearance.

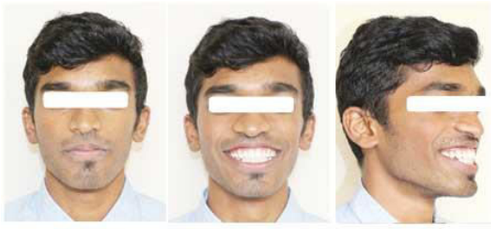

FIGURE 7: POST TREATMENT EXTRA ORAL PHOTOGRAPHS

Figure 8: Post-treatment intraoral photographs

CRITICAL APPRAISAL

There was a marked improvement in the facial profile.

Paraesthesia persisted post-surgically. Lower lip appears everted.

Amount of root resorption was as in pre treatment

DISCUSSION

Every orthodontic treatment aims to achieve an adequate occlusion thus ensuring satisfactory and healthy functioning of the stomatognathic system's physiological routine, an optimal facial, oral and dental aesthetics, resulting in a long-term stability.[10] Skeletal class III malocclusion is a classic example of "easy to be recognized but difficult to treat", the situation where sometimes orthodontic possibilities are limited and need support from other specialties, particularly surgery [11-13]. However, the

key to a successful treatment lies in understanding and integrating these two specialties in seeking the best alternatives and procedures.

The current surgical methods for correcting skeletal Class III problems are ramus osteotomy to set back a prognathic mandible, mandibular inferior border osteotomy to reduce chin height and/or prominence, and/or LeFort I osteotomy to advance a deficient maxilla, often with segmentation to allow transverse expansion.[14,15]

Although isolated surgery of the mandible for prognathic lower jaw has long been the most commonly applied procedure for Class III correction, recently bimaxillary surgery is becoming more common. In the hierarchy of stability, simultaneous "both jaw surgery" with RIF is considered more stable than mandibular setback with an 80% chance of <2 mm change and only 20% chance of 2–4 mm relapse and bimaxillary surgery was more stable beyond 2 years postoperatively than single-jaw surgery.

In order to obtain successful results when treating these patients, the integration of several disciplines, from the initial assessment until the conclusion of the set goals is essential, It is necessary the integrated effort of orthodontists, surgeons, prosthetic dentists and other specialists that the case may require. It is imperative to have a close collaboration between all of them for orthognthic surgery to produce satisfactory facial results for each specialty and for the patient while correcting the malocclusion as it was in our case where the treatment was carried out through orthodontic preparation and orthognathic surgery.

In the presented case, surgical-orthodontic treatment was the best option for achieving an acceptable occlusion and a good esthetic result as diagnosed with the help of the clinical, cephalometric, and Dolphin software prediction tracings.

An experienced multidisciplinary team approach ensures a satisfactory outcome.Pre-surgical orthodontics removes all the dental compensations and suggests the location and extent of the skeletal discrepancy. Normal skeletal base relationship is achieved by maxillary osteotomy and set back of the prognathic mandible. Post-surgical orthodontics guides the normal occlusal rehabilitation by correcting any emerging dental discrepancies.

CONCLUSION

Combined surgical and orthodontic approaches for severe skeletal discrepancies which are complicated by soft tissue adaptations and the combined bi-jaw approach with adjunctive profile enhancement procedures resulted in better harmony between the underlying soft tissues and skeletal framework.

Furthermore, this multidisciplinary approach favoured in the successful management of a patient with a prominent chin, relapsed Angle's Class III malocclusion by bimaxillary orthognathic surgery to achieve superior function, stability, facial esthetics and an ideal occlusion with good postoperative stability.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent. The patienthas given his/her consent for his/her images and other clinical information to be reported in the journal. And the patient understands that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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